360-degree Photographs within Nuclear Facilities

The Challenge

The Hanford site has hundreds of contaminated facilities which require periodic entry for operational and/or maintenance purposes. Most of these facilities are in various stages of deactivation and/or decommissioning (D&D). It is not uncommon for considerable time to pass from when the facility ceases operation to when it is decomissioned. Due to this time lag and other factors, the people performing the D&D work are generally not the same people who operated and were familiar with the facility. Therefore, personnel who have never seen the layout and condition of the rooms or facility are at a disadvantage. Consequently, the work takes longer, requires multiple entries, which increases exposure and risk to workers.

The Nikon Coolpix 990 digital camera with a resolution of 3.3 megapixels

Current Approach

Efforts are typically made to document the "as left" condition of rooms and cells of non-operating facilities using various media including engineering drawings, supporting documents, traditional (flat) photographs, videos, etc. Site workers often experience difficulty in orienting and visualizing the physical situation and condition from such traditional media. With the flat photos, it is difficult for a person who has never been in the room to orient and gain a perspective; and often the item of interest is not included in the photo. Historic video footage also has shortcomings in that it can miss items of interest or quickly pan across areas of interest with little opportunity to study the area. Therefore, it becomes necessary to make multiple entries into these hazardous areas to gain information for pre-job planning and training purposes.

New Technology

High-resolution digital cameras in conjunction with newly developed software techniques now make 360° photo coverage possible. These new systems provide the ability that allows a person to view all around, up and down (i.e., all wall, floor and ceiling surfaces). The software has been developed by the Internet Pictures Corporation (iPIX®) and is mainly being used for marketing on the Internet and in the field of real estate.

The images can be enhanced using any of the many photo enhancement software packages that are commercially available (e.g., Adobe Photoshop) before building the 360º photo using the iPIX® software.

Benefits and Features

- 360° photos that allow a person to virtually look all around, at the ceiling and at the floor
- Allows other 360° photos to be linked to create a tour
- Additional information in the form of sound, text and high resolution flat photos can be attached
- Reduces the need to enter hazardous areas, enhancing ALARA

The iPIX software allows attachment of other information to a 360° photo such as sound files providing audio information; flat photos providing additional detail, or information about what is behind a panel or around a corner. Additional text information can also be attached to the image to show radiological conditions or identify other hazardous present but not readily visible. The software also allows other 360° photos (e.g., of adjoining spaces in a building) to be attached to create a virtual tour where the user can move from area to area or room to room. The user is able to navigate to, stop the image, zoom-in and study specific areas of interest.

Demonstration Description

The 360° photos technology was first successfully used to make a photo tour of several rooms at the Hanford 324 Building, including its Cask Handling Area (CHA). Within a 15-minute period, this radiation area was entered, tripod and camera set-up on the central floor area, and image data collected. The equipment is very portable, relatively easy to use, and reasonably priced. All necessary hardware was purchased for less than $2000. Processing of each image costs about $25.

Demonstration Results

The successful use of this technology at the 324 Building demonstrated its benefits when applied to hazardous areas within other nuclear facilities such as the 231-Z cells, the 209-E Critical Assembly and Mix rooms, and the 242-B/BL fuel testing facility. These photo tours can now be used to minimize entries for touring, training, and pre-job planning purposes. A 360° photo of the 209-E Critical Assembly room is provided in the attached file; double click on the icon to open the application and then simply move the cursor until you get a hand pointing in the direction you would like to see and click the left mouse button to view up/down/right/left around the room.

CARMidRmE_700_email.exe

A virtual tour of any building or room can be used for training; people can see what is there, focus on points of interest and discuss what they would do or how they would respond to present conditions. Planners, operators and maintenance people can make use of the tour to plan work and decide ahead of time, while looking at the areas of interest, what and how they will perform the tasks they need to perform. The technology strongly supports ALARA principles.

The technology can be used to document the conditions, especially hazards, left in a room or at a facility. Low-resolution versions of the tour could be placed on the Internet to allow others to view the area documented.

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